

**IN THE CLAIMS:**

The text of all pending claims (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. When strikethrough cannot easily be perceived, or when five or fewer characters are deleted, ~~[[double brackets]]~~ are used to show the deletion. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please AMEND claims 1 and 6 in accordance with the following:

1. (currently amended) A copper-nickel-silicon quench ~~substrate~~surface of a thermally conducting alloy for rapid solidification of molten alloy into strip, having a two-phase microstructure with cells of copper rich regions surrounded intimately by a discontinuous network of nickel silicide and chromium silicide phases, said cells having a maximum cell size of greater than 1  $\mu\text{m}$  and less than 250  $\mu\text{m}$  in an aspect ratio of about 1.

wherein said thermally conducting alloy is a copper-nickel silicon alloy consisting essentially of about 6-8 wt % nickel, about 1-2 wt % silicon, about 0.3-0.8 wt % chromium, the balance being copper and incidental impurities.

2. (cancelled)

3. (previously presented) A quench substrate as recited in claim 1, wherein said thermally conducting alloy is a copper-nickel silicon alloy consisting essentially of about 7 wt % nickel, about 1.6 wt % silicon, about 0.4 wt % chromium, the balance being copper and incidental impurities.

4. (previously presented) A quench substrate as recited in claim 1, wherein the cells of the two-phase microstructure have sizes ranging from 1 to 1000  $\mu\text{m}$ .

5. (previously presented) A quench substrate as recited in claim 4, wherein the cells of the two-phase microstructure have sizes ranging from 1 to 250  $\mu\text{m}$ .

6. (currently amended) A process for forming a quench casting wheel substrate comprising:

casting a copper-nickel-silicon ~~two-phase~~ alloy billet having a composition consisting essentially of about 6-8 wt % nickel, about 1-2 wt % silicon, about 0.3-0.8 wt % chromium, the

balance being copper and incidental impurities;

mechanically working said billet to form a quench casting wheel ~~substrate surface~~ said mechanical working being carried out at a temperature ranging from about 760 to 955 °C; and

heat treating said ~~substrate surface~~ to obtain a two-phase microstructure ~~having a cell size ranging from about 1–1000 μm~~, said heat treating being carried out at a temperature ranging from about 440 to 955 °C, wherein the two-phase microstructure has cells of copper rich regions surrounded intimately by a discontinuous network of nickel silicide and chromium silicide phases,

wherein said cells have a maximum size of greater than 1 μm and less than 250 μm in an aspect ratio of about 1.

7. (previously presented) A process as recited by claim 6, wherein said mechanical working includes extruding said billet to break down the residual silicide structure that forms during solidification of the cast ingot and to create sufficient strain to induce nucleation and grain growth uniformly through the entire part.

8. (previously presented) A process as recited by claim 6, wherein said mechanical working includes ring rolling said billet to break down the residual silicide structure that forms during solidification of the cast ingot and to create sufficient strain to induce nucleation and grain growth uniformly through the entire part.

9. (previously presented) A process as recited by claim 6, wherein said mechanical working includes saddle forging said billet to break down the residual silicide structure that forms during solidification of the cast ingot and to create sufficient strain to induce nucleation and grain growth uniformly through the entire part.

10. (previously presented) A process as recited in claim 6, wherein the mechanical working produces mechanical strain equivalent to a reduction in area ranging from at least about 7:1 to 30:1.

11. (previously presented) A process as recited in claim 6, wherein said heat treating is a two-stage process wherein a first stage is a heat treatment for a time from about 1 to 8 hours at a temperature from about 955 to 995 °C, and a second stage is a heat treatment to nucleate and grow the silicide phases for a time of about 1 to 5 hours at a temperature of about 440 to 495 °C.

**REMARKS**

**INTRODUCTION:**

In accordance with the foregoing, claims 1 and 6 have been amended. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1 and 3-11 are pending and under consideration. Reconsideration is respectfully requested.

**INTERVIEW:**

On November 2, 2006, an interview was held with Examiner IP, Nicholas DeCristofaro, Shinya Myojin, and attorney Darleen J. Stockley. Differences between the cited references and independent claims 1 and 6 were discussed. Applicants thank the Examiner for the interview.

**DOUBLE PATENTING:**

On pages 2-3 of the Office Action, claims 1 and 3-11 were rejected on the ground of nonstatutory judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of USPN 6,764,556 in view of Popa et al. (reference of record).

In accordance with the Examiner's suggestion, a terminal disclaimer is being submitted herewith to overcome the rejection based on the judicially created doctrine of obviousness-type double patenting because U.S. Patent No. 6,764,556 is commonly owned with the present application by METGLAS, INC. (see details in Terminal Disclaimer enclosed herein).

Hence, claims 1 and 3-11 are now submitted to be allowable under the nonstatutory judicially created doctrine of obviousness-type double patenting over claims 1-9 of USPN 6,764,556 in view of Popa et al. (reference of record).

**REJECTION UNDER 35 U.S.C. §103:**

In the Office Action, at page 4, claims 1 and 3 were rejected under 35 U.S.C. §103(a) as being unpatentable over Popa et al. (PTO-1449, AM; hereafter Popa) in view of USPN 4,818,307 to Mori (hereafter, Mori). The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

For clarity, claim 1 has been amended to change "substrate" to ---surface---, as is recited on page 9, line 12 of the specification, and to include the terminology "said cells having a maximum cell size of greater than 1  $\mu\text{m}$  and less than 250  $\mu\text{m}$  in an aspect ratio of about 1." Independent claim 6 has been amended in a similar fashion.

It is respectfully submitted that neither Popa nor Mori teaches or suggests amended

independent claims 1 and/or 6 of the present invention.

It is respectfully submitted that the copper-based alloy system of Mori requires the presence of B and Fe (the present invention does not) and does not require Cr (the present invention does). As described in Table I below, these chemical differences yield very different Hard Phases and Strengthening Mechanisms.

Table I

Reference	Hard Phase(s)	Strengthening Mechanism	Key Mechanical Property
10/644,220	Discontinuous network of Ni-silicide + Cr-silicide particles on grain boundaries	Heat Treatment (Solutionize + Precipitation Harden)	Resistance to weld induced thermal fatigue during continuous casting (better than in 6,64,566)
Popa et. al.	Ni-silicide + Cr-silicide	Heat Treatment (Solutionize + Precipitation Harden)	Resistance to abrasion during continuous casting HT strength
USPN 4,818,307 (Mori)	Fe,Ni-silicide Fe,Ni-boride Cr,Ti-carbide	Dispersion Strengthen	Resistance to abrasion

In addition, the alloy system of Mori can only be produced as a functional part by thermally depositing a layer of the alloy onto a metallic substrate (Fabrication Technique in Table II: see below). Thus, the material of Mori is used on a hard surface on a metallic part rather than as a monolithic part in itself. It is respectfully submitted that it is known to those skilled in the art that all known rotating substrates for amorphous metal strip casting have been monolithic.

Table II

Reference	Ni	Si	Other	Fabrication Technique
10/644,220	6-8	1-2	0.3-0.8 Cr	Cast + Mechanical Deformation + Heat Treatment
Popa et. al.	3.75	0.9	0-0.6 Cr 0-0.02 Zr 0-0.27 Ti	Cast + Mechanical Deformation + Heat Treatment
USPN 4,818,307 (Mori)	5-30	1-5	0.5-3 B 4-30 Fe 0-5 Ti 0-10 Mn 0-2 C 0-10 Cr	Copper alloy powder containing dispersed silicides, borides and carbides thermally deposited on a metallic base

Like Popa et al., Mori targets applications in abrasion resistance. Again, this is different from the resistance to weld induced thermal fatigue needed in rotating substrates for amorphous metal strip casting that is obtained in the present claimed invention.

As discussed with the Examiner in the interview on November 2, 2006, the present invention (Ser. No. 10/644,220) describes two distinct hardening phases discontinuously arranged at the grain boundaries. The structural difference between structure of the quench substrate alloy of the present invention (see amended independent claim 1, and produced by the process of amended independent claim 6) is made possible by the specifically cited fabrication processes of the present invention, which provides cells having a maximum size of greater than 1  $\mu\text{m}$  and less than 250  $\mu\text{m}$  in an aspect ratio of about 1 of Ni-silicide and Cr-silicide particles on grain boundaries. The quench substrate alloy of amended independent claim 1, and the quench substrate alloy produced by the process of amended independent claim 6 of the present claimed invention, have a structure with two distinct hardening phases discontinuously arranged at the grain boundaries, which yield more effective Key Mechanical Properties. It is respectfully submitted that Popa does not teach or suggest that such cells have a maximum size of greater than 1  $\mu\text{m}$  and less than 250  $\mu\text{m}$  in an aspect ratio of about 1.

Thus, it is respectfully submitted that Popa et al. (PTO-1449, AM), even if combined with Mori et al. (USPN 4,818,307), does not disclose or suggest amended independent claim 1 of the present invention. Hence, amended independent claim 1 is submitted to be patentable under 35 U.S.C. §103(a) over Popa et al. (PTO-1449, AM) as applied to claim 1 above, and further in view of Mori et al. (USPN 4,818,307). Since claim 3 of the present invention depends from claim 1, claim 3 is patentable under 35 U.S.C. §103(a) over Popa et al. (PTO-1449, AM) as applied to claim 1 above, and further in view of Mori et al. (USPN 4,818,307) for at least the reasons that amended independent claim 1 is patentable under 35 U.S.C. §103(a) over Popa et al. (PTO-1449, AM) as applied to claim 1 above, and further in view of Mori et al. (USPN 4,818,307).

#### **CONCLUSION:**

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited. At a minimum, this Amendment should be entered at least for purposes of Appeal as it either clarifies and/or narrows the issues for consideration by the Board.

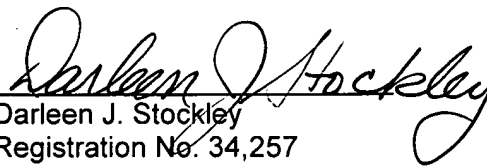
If the Examiner has any remaining issues to be addressed, it is believed that prosecution

can be expedited and possibly concluded by the Examiner contacting the undersigned attorney for a telephone interview to discuss any such remaining issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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